The Impact of Physician Order Entry on Nursing Roles

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This study examines the impact of physician order entry (POE) on nurses perceptions of work, quality of care, and nurse/physician communiction. Four hospitals that have implemented a computerized order-entry system with POE were compared with four similiar hospitals using the same computerized system with clerk order entry only.
Three factors were extracted from the 29 item survey using principal component extraction with varimax rotation that accounted for 16.5%, 12.4% and 8.7% of the variance respectively. Three scales were constructed from these factors measuring perceptions of impact of the information system on the quality of care, job control, and nurse/physician communication.
Nurses working in the POE environment rated their computer system as having greater impact on the quality of care and lower ratings of perceived control than those working in non-POE environments. No differences were found between nurses working in POE environments and those working in POE in terms of their ratings of frequency of contact and ease of access to physicians.

INTRODUCTION

The independent use of a fully integrated hospital information system by physicians is often thought to be essential to maximize quality management activities, cost control, and clinical decision support. Full acceptance of an electronic medical record by physicians often requires dramatic changes in the work patterns of a whole institution and the cooperation of many disciplines [1,2,3]. These changes in how work is organized would be expected to impact not only specific behavior patterns but motivational variables and the quality of interdisciplinary relationships as well [2,4,5] . This study specifically examines the impact of POE on nurses perceptions of competence and control in the workplace, quality of care, interest in work, and relationship between nurses and physicians.

Nurses are a central component to the delivery of health care as a function of their direct interaction with patients. Their involvement and cooperation may be critical for successful implementation of any information system. Due to their numbers and their proximity to patient care, they also will be directly impacted by any changes in an information system, such as the introduction of physician order entry (POE).

Information systems in general have been found to increase nurses productivity, especially in terms of eliminating overtime [6,7], improve information transfer, such as reducing the need for telephone calls [8,9], and improve relationships between nursing and other departments [10]. Other studies have shown increased job satisfaction, improved sense of teamwork, and better interdisciplinary communications with the implementation of an electronic information system [11,12,13].

However, few studies have examined the impact of POE specifically on nurses. Lee et al [5] evaluated implementation of POE at the Brigham and Women's Hospital in Boston and found that physicians were in general more satisfied than nurses. Specific reasons for this relative dissatisfaction were not explored. Massaro [2] found that nurses reported stress due to less communication with providers as they could enter orders from any place in the hospital. Tiech et al [4] found that nurses reported that the computer system required the same inputs as paper records, with no added value to justify its use.

Most of these studies were reporting open-ended comments and did not systematically measure these concepts specific to nursing. Their findings, however, suggest that the strongest impact of POE on nurses would be in the areas of communication patterns between physicians and nurses, intrinsic interest and control over the work arena, and perceptions of quality of care.

The purpose of this study was to examine nurses perceptions of the impact of POE on three general dimensions. The first area addressed was perceptions of the quality of care. Physician order entry is expected to influence the quality of care and although direct measures were not done, *perceptions of the quality of care* can be assessed. In this study, quality of care was measured generically in terms of the overall concept, time with the patient, perceptions of competence, general working relationship with physicians, errors in ordering, and accuracy of documentation.

The second area of focus in this study was the *communication patterns between physicians and*

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nurses, specifically perceptions of frequency, access, and the clarity of information from the physician. Physician order entry dramatically changes the way orders are entered and may result in less direct communication between physician and nurses. Items developed for this concept were adopted from Shortells et als [14] survey tool on the impact of caregiver interaction on the quality of care. In this study, caregiver interaction was defined as leadership, timeliness of communication, accuracy of communication, openness of communication, and coordination. These authors found that high levels of caregiver interaction were significantly related to the quality of care in an ICU settings.

The final area of focus combined perceptions of control, perceptions of personal competence and interest in the job. Competence, control, and interest are basic components of *intrinsic job motivation* which is defined as the tendency to engage in an activity without external rewards or evaluation [15]. Intrinsic motivation is an important component of job satisfaction and have been shown in previous studies to be impacted by electronic information systems [9,10,13]

These three areas of concern were measured by a questionnaire survey of 201 nurses in 8 hospitals within the VHAs system of hospitals. Two groups of hospitals were included and both use the same application of the VAs Decentralized Hospital Computer Program (DHCP). Four hospitals were actively implementing POE and the other four used clerk entry of orders. This study compares nurses perceptions of the impact of the same computer system when it is implemented with POE as compared to when it is not. Comparing hospitals that have the same computer system but differ in terms of POE implementation allows for a more precise evaluation of the impact of POE itself. In other words, the computer system is not being evaluated at the same time as POE implementation.

The VHA provides an excellent environment in which to conduct such an investigation because the 171 acute care facilities and about 350 outpatient facilities that constitute the VA system operate relatively independently but also share a single information system. This type of organization permits comparisons between different institutions using the same or similar applications.

METHODS

Information System

All hospitals were using the current version of order entry for the VA, called OE/RR 2.5 at the time of the survey. Order Entry/Results Reporting 2.5 (OE/RR 2.5) was released to the field in March, 1993. This application integrates several clinical packages (e.g., pharmacy and lab) and provides a single environment where providers can enter orders and obtain clinically relevant patient information. To some extent, specific implementation of this software varies across sites. Sites had the option of implementing some components over others and to customize menus. In addition, none of the 4 POE hospitals were 100% physician order entry, although all were working towards that goal.

Survey Construction

The survey consisted of 29 items using a Likert like format. Respondents were asked to agree/disagree with the statement on a 7-point scale. About half of the items were phrased in the negative and reverse scored. The items were constructed to focus on the three conceptual areas described above.

Hospital Selection

Eight VA hospitals were chosen for the study. Four had established physician order entry on at least some portion of the hospital [Weir, et al, 1995]. These four hospitals were matched to four similiar hospitals in terms of region and general size, but who used clerk order entry. Each chief nurse was sent a package of 10 surveys which he or she was instructed to give to "full-time RNs who have worked on that ward for at least a year." All survey responses were anonymous.

RESULTS

Return Rate

Overall, 201 of 605 given the survey responded. These 201 came from 112 wards that were sent questionnaires, with an average of 5 RNs who qualified (worked in the ward for 1 year and were full-time RNs). Response rates differed in terms of hospital size with the smaller hospitals responding more. There was no difference in response rates between the POE hospitals and the non-POE hospitals.

Scale Construction

Scales were constructed from the survey items by first performing a principal component extraction with varimax rotation on the 29 items in the survey. Three factors were extracted that accounted for 16.5%, 12.4% and 8.7% of the variance respectively. The three factors could be described as: 1) Perceived impact of the computerized system in terms of quality of care, communication with physicians (clarity of orders), perceptions of personal competence, fewer errors, and more time with the patient; 2) Communication with physicians as measured by frequency of communication, judgments of the

sufficiency of the information; and access, and 3) Perceived control as measured by questions regarding dependence on physicians, personal responsibility for work, and feelings of job interest and control. Items with their respective factor loadings are presented in Table 2.

Three scales were constructed by summing responses across selected items. For factor 1, *Impact*, 8 items were chosen above a factor loading of 0.60. The last three items, (computer increases accuracy, control, and interest in work) were dropped as alphas were higher without them. Factor 2, *Physician - Nurse Communication*, was initially constructed from 7 items with factor loadings above 0.45. Access to adequate terminals was dropped, leaving 6 items. For the third factor, *Control*, items were chosen above a factor loading of 0.50. All 7 items fitting this requirement were included.

Table 2. Factor loadings for survey items.

SURVEY 1	FACTORS		
	Impact	Comm	Control
FACTOR 1			
*Quality of care	0.83	-0.14	0.02
*Physician/Nurse Relationship	0.71	-0.20	0.06
*Time with Pt	0.69	0.-15	-0.01
*Competence at job	0.66	0.06	-0.25
*Decreased errors	0.66	-0.05	0.14
Interest in job	0.65	0.20	-0.24
Control over job	0.62	-0.88	0.15
Accuracy	0.61	0.02	-0.07
Computer has no effect on control	-0.42	-0.41	-0.13
FACTOR 2			
*Frequent enough access to physicians	0.02	0.73	-0.07
*Quality of info. from physician	-0.07	0.72	0.06
*Clarity of information from physician	0.02	0.65	0.02
*Desire more frequent physician contact	0.04	0.61	0.03
*Difficult to contact physician	-0.03	0.61	-05
Adeq. # Terminals	-0.05	0.53	-0.02
*Can contact physican	-0.01	0.48	-.11
Control pt. outcomes	0.03	-0.43	-0.17
Timeliness of physician orders	-0.17	0.42	0.30
FACTOR 3			
*Computer decreases my responsibility	0.04	0.19	0..65
*Computer increases j ob excitement	-0.34	0.08	0.60
*My job is boring	-0.18	0.01	0.56
*Computer gives docs more control	0.05	0.16	0.56
*Comp. increases my dependence	0.15	0.08	0.54
*I can impact patient outcomes in my job	0.13	0.04	0.51
*Computer effects involv. with docs	0.04	0.40	0.51
Computer increases interest	-0.27	-0.05	0.48
Job is interesting	0.21	0.02	0.44
I am competent	0.14	-0.02	0.31
I have sufficient skills to do my job.	-0.02	-0.14	-0.16

Note: Items with one asterisk were included in the respective scales.

Reliability's for the scales were adequate (Impact Scale: alpha=0.80; Physician Access = 0.73; and Control = 0.72). Correlation between the scales were low, but significant (see Table 3). Higher perceptions of control over ones work was positively associated with perceptions that the computer system impacts quality and with perceptions of adequate communication with physicians.

Table 3. Correlation's between scales.

	Impact	Comm	Control
Impact	1.00	0.14	0.19**
Access		1.00	0.18*
Control			1.00

Note: Two asterisks (**) indicate significance at the p< .01 level.. One asterisk (*) indicates significance at the p <.05 level.

Comparing POE and non-POE hospitals

Three one-way ANOVAs were performed on each of the newly constructed variables to address the perceived effects of POE. Perceptions of the impact of the computer system on the quality of care were significantly different between those nurses working in POE settings versus those who did not. Nurses working in the POE environment rated their computer system as having greater impact on the quality of care and enhancing their job competence than nurses working in a non POE environment ($F_{1,177} = 7.56$; $p = .007$; $M_{POE} = 20.4$, $M_{N\text{-}POE} = 17.6$).

Similarly, perceptions of control and interest in work was also found to be significantly different between the two groups with nurses working in POE environments responding with lower ratings of perceived control than those working in non-POE environments ($F_{1,190}$ =5.01; p = ..03; M_{POE}= 31.3, $M_{N\text{-}POE}$= 33.0)

Finally, no difference was found between nurses working in POE environments and those working in POE in terms of their ratings of frequency of contact and ease of access to physicians ($F_{1,196}$ =1.21; p = .21; M_{POE}= 27.8, $M_{N\text{-}POE}$= 28.9)

DISCUSSION

Overall, nurses working in POE environments perceived their computer system as having more of a positive benefit to patient care than nurses working with a similar computer system where POE had not been implemented. These nurses perceived that the computer system made them feel more competent at their job, that fewer errors were committed, more time was available for their patients, documentation was more adequate and overall relations with physicians were improved. Perceptions of quality of care did not significantly correlate with ratings of nurse-physician communication suggesting that the impact of POE on quality was not a function of differences in nurse-physician communication.

However, these nurses also reported perceptions of decreased control, diminished interest in their jobs, and lower feelings of responsibility for their work as a function of the computer system. In addition, they reported feeling more dependent on doctors and less personally responsible in their roles. This dependence did not appear to be a function of their perceived overall relationship with physicians, nor did it appear to be a result of nurse-physician communication patterns.

The lower ratings of control and job interest by nurses working in a POE environment could be a function of a relative lack of knowledge in using the system. Even though all hospitals had to have OE/RR 2.5 implemented for at least 6 months, the POE hospitals were more likely to be in a continuous process of evolution. We did not measure training, levels of computer experience, and computer literacy of nurses so the data to address this issue is not available, although recent sites visits to the specific facilities indicate that nurse training has been limited.

The fact that nurses working in a POE environment reported no difference in their perceived access to physicians than nurses working in a non-POE environment suggests that the computer did not decrease the need to talk to physicians nor did it function to make them more or less accessible. The ready availability of residents may be one reason why this variable was not impacted. Many VA hospitals are academically affiliated and have large number of residents available. Of the 8 hospitals in this study, 7 of them were affiliated with major medical schools.

In summary, implementation of POE appears to have significant effects on nursing perceptions of the quality of care, competence, control, and job interest. Understanding the factors associated with implementing POE involves taking a systems perspective [2,3,4]. Size of the hospital, previous organizational climate and practices, interactions between groups and experience with the system all contribute to the impact of an information system [9,10,16,17].

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